A CASE OF HUMAN TRYPANOSOMIASIS IN NYASALAND WITH A NOTE ON THE PATHOGENIC AGENT

BY
HUGH S. STANNUS
AND
WARRINGTON YORKE

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In October, 1908, the first case of human trypanosomiasis was discovered in Nyasaland. A native who was examined in consequence of his having accompanied his employer through the Congo was found to be infected. He presented no symptoms, and from that time to the present, during which period treatment has been given, he has preserved excellent health. During the next year further cases came under observation which, in the absence of any history of infection in the then known 'palpalis areas' gave rise to suspicions as to the local conditions in Nyasaland. Investigations carried out to determine the presence or otherwise of *Glossina palpalis* in the Protectorate proved negative, and uncertainty persisted.

In the second half of the year 1910, however, the occurrence of a case in a European, whose movements were exactly known, followed by the discovery of some forty cases in a localised area in the country, has brought into relief the subject of human trypanosomiasis in Nyasaland.

For reasons which the above remarks make obvious, the case of this European is now published in some detail, and the question of the identity of the pathogenic agent dealt with in view of the fact that a trypanosome derived from a case of sleeping sickness, contracted in North-Eastern Rhodesia, has been shown by Stephens and Fantham (1910) to present certain morphological peculiarities, and also by Yorke (1910), a pathogenicity in experimental animals, which differentiate it from all known strains of *Trypanosoma gambiense*.

The history of the patient is as follows.

P. R., aged 60, male, of Beaufort West, Cape Colony, came to Nyasaland on a shooting trip; he landed at Chinde, and travelling by the Zambezi and Shiré rivers, passed up through Blantyre on July 27th, 1910, on his way to Angoniland, arriving at Manda on July 1st, where he remained eleven days. On July 1st he travelled to Mpastso, via Mpunzi and Dedza, thence to Mt. Dzobwe, forty miles to the westward, and back again; leaving again on the 19th he went to Mpinzi, remaining in the neighbourhood of the Diampwe river until the 23rd, but reaching Nkoma the following day. Here he remained till the 28th, when he proceeded to Mvera, where he again spent some days. Here, on August 13th, he saw a case of sleeping sickness, a native whom he photographed as he lay in the open, but did not approach within a few yards of him. He left Mvera for the lower country towards the shores of Lake Nyasa for the shooting. On the 14th he was at Maganga's village; the 15th and 16th were spent in the Patsanjoka dambo, a large area of partly uninhabited country, but containing much game. On the 17th he was at Nsarula, a village on the Lintipi river. During these three days all the party were bitten by tsetse flies (species unrecognised), but the patient suffered most severely owing to an exposed neck. A return was made to Mvera on the 18th, and the next day he went on to Kongwe, where he complained that the bites on the neck were painful, he, however, continued his journey the following day (20th), and reached Nambamba on the 22nd. During the journey he had not appeared very well, and on the day of arrival at Nambamba gave up shooting owing to the pains in the neck. The following day his neck was examined by one of his companions, who found a 'lump about the size of a shilling, rather light in colour surrounded by a dark purple ring,' in the sub-occipital region where pain had been complained of; at the centre of the lump was what appeared to be a puncture due to the bite of a fly. On the 24th, at Sante, on the Bua river, pain in the neck was shooting up into the head, causing severe headache. The lesion on the neck was 'hard as if an abscess were developing,' so poultices were applied; the temperature was found to be 102·5° F. The following day the swelling of the neck had extended; the face was puffy, speech impeded and the temperature remained at 103° F. On the

28th the lump had disappeared, but the oedema persisted. The temperature varied between 102° and 104° F. during the next few days, and the condition remained unchanged. On the last day of August the blood was examined, and trypanosomes found in large numbers. An injection of six grains of atoxyl was immediately given (11 a.m.), followed twelve hours later by a critical rise of temperature to 108° F., and then a fall to 99° F. the following morning, when atoxyl (six grains) was again given.

Progress of case.

Rapid improvement took place to commence with, and by the end of a few weeks patient was able to sit up all day and walk a little; the appetite was good, and there was little in the way of symptoms; constipation, an old trouble, was marked.

On September 24th there was an attack of adenitis, involving the posterior cervical glands of both sides, which responded to treatment by the application of Linimentum A.B.C.; one large gland, about the size of a filbert-nut, persisted for one week. There were several recurrences of this adenitis during the next two months.

A characteristic rash made its appearance on several occasions, the first was on the 78th day, lasting two or three days. The temperature showed a marked periodicity during the earlier part of the illness; it rose on Tuesday of each week and remained between 102° and 104° F. till Thursday, followed by a period of normal temperature till the following Monday; later the maxima showed a steady fall and the apyrexial periods became progressively longer, two days low fever and five days free in each week. The accompanying temperature chart shows these points.

Preceding or accompanying the rises of temperature there were constitutional symptoms, the patient feeling ill and bilious, often with vomiting. Anaemia and emaciation, general cachexia, were progressive though the mental condition remained good. With the constitutional symptoms patient retired to bed, but at other times sat up in a chair.

Such is a short account of the case up till the time he left the country on January 13th, 1911, for South Africa, where he died in April of the same year.

One fact is worthy of special note, and that is the time which elapsed between the patient being bitten by tsetse fly and the onset

of symptoms which practically fixes the incubation period at between six and ten days.

The treatment given was as follows:—For the first five weeks six grains of atoxyl were injected intra-muscularly on Thursday and Friday of each week. For a second period of five weeks three grains of atoxyl were given every 3rd and 4th day. From the 11th to the 18th week soamin (ten grains) was administered on two successive days in every other week, and perchloride of mercury once in the intervening weeks. As the injections of mercury were very painful, and were not followed by any improvement, they were discontinued and soamin alone administered in ten grain doses every Thursday and Friday.

Blood. On the first occasion when the blood was examined trypanosomes 'swarmed,' the field resembling the blood of a rat heavily infected with *T. gambiense.* Their numbers diminished with treatment, and on some occasions none were found in the course of a fairly quick examination. Though it was impossible to make careful enumerations of trypanosomes, still it was noticed there was a certain periodicity in their numbers corresponding to the temperature curve, fewness being associated with the apyrexial intervals, larger numbers with the rises in temperature.

Morphological features of the parasite in the blood of the patient. Unfortunately, the material at our disposal was rather limited, consisting of a slide of the blood made on August 31st, the day on which the disease was first diagnosed, a couple of slides made on November 21st, and one on January 4th, when the patient passed through Zomba on his way to Chinde. The slide made on August 31st contained numerous trypanosomes, and was sent to the Sleeping Sickness Bureau and examined by Sir David Bruce, who found that the parasite did not differ in any way from the Uganda *T. gambiense* (1910).

In the specimens prepared on November 20th and January 4th trypanosomes were more scanty, and the parasites could not be distinguished in any way from *T. gambiense.* The parasite presented the characteristic dimorphism, slender forms with long free flagella, short stumpy forms with no free flagella, and intermediate forms being found.

The Morphology of the parasite in animals experimentally

infected. The parasite was also studied in the blood of several experimental animals, and the results, in short, communicated by us (1911) to the Royal Society.

An English rabbit, bred in Nyasaland, previously shown to be free from any trypanosomal infection was infected with the trypanosome by subcutaneous inoculation with a small quantity of the patient's blood, taken on the 135th day, and subsequently sub-inoculations were made into a monkey (*Cercopithecus sp.*) and a goat. The animals were kept in fly-proof cages. The rabbit and monkey both became heavily infected and exhibited numerous parasites in the peripheral blood, whereas in the goat trypanosomes were only occasionally found in small numbers.

Examination of the parasite in the blood of the rabbit and monkey at once revealed the same morphological peculiarity which was observed by Stephens and Fantham in the trypanosome obtained from a case of sleeping sickness contracted in the Luangwa valley of North-East Rhodesia, i.e., among the stout and stumpy forms some had the nucleus at the posterior (non-flagellar) end (Plate XIX, figs. 5-12 and 14-16). When the parasites were numerous it was found that these posterior nuclear varieties formed from 1 to 4 per cent. of the total number of trypanosomes present. Posterior nuclear forms were only observed when the blood contained fairly numerous parasites. They measured 17 to 22 μ long.

The other parasites found were indistinguishable from *T. gambiense* and exhibited the usual dimorphism. The cytoplasm of many of the parasites observed in the blood of the monkey was vacuolated in a remarkable manner, sometimes as many as five or six large clear vacuoles were seen in a single parasite (figs. 3, 4, 5 and 9). In many of the parasites the cytoplasm contained large coarse granules. The posterior extremity of many of the parasites, especially those in which the nucleus was situated posteriorly, presented a blunt 'cut away' appearance. Parasites similar to those described by Stephens and Fantham as 'snout' forms were likewise observed, but they did not appear to be a prominent feature. After finding these posterior nuclear forms in the blood of the rabbit and monkey, we re-examined carefully the slide of the blood of the patient himself, made on August 31st, at a time when the parasites were numerous. A prolonged search failed to reveal the presence of

any typical posterior nuclear forms, but several dividing forms were seen, in one of which the nuclei were situated close to the blepharoplast (figs. 16 and 17).

Pathogenicity. Unfortunately, absence of laboratory animals prevented the investigation of this point. The three animals (rabbit, monkey and a goat) inoculated with the strain, by one of us (H. S. S.) in Nyasaland, were all easily infected.

In the case of the *Rabbit* the temperature rose before the completion of the sixth day, and trypanosomes were found for the first time in the peripheral blood on that day. The animal was listless and showed a disinclination to feed. The temperature reached a maximum of 105° F. on the 10th day and then fell, reaching 100° F. on the 12th day, rising again immediately afterwards. There was a second fall on the 23rd day and again a rise till the death of the animal on the 27th day. Loss of appetite, rapid emaciation and anaemia were noted, with onset of paralysis during the twenty-four hours preceding death, the muzzle resting on the ground, then involvement of fore-quarters and stertorous breathing; other symptoms noticed, usually seen in rabbits suffering from trypanosomiasis, were oedema of face and purulent discharge from the nose and ears. During the last six days trypanosomes were present in considerable numbers.

Monkey. Inoculated from the rabbit. Parasites appeared in the peripheral blood on the 7th day. During the next week trypanosomes were present in considerable numbers, but later they were scanty though persisting till the time of its death, on the 58th day. There was an irregular pyrexia, the temperature varying between 99° and 102° F. Emaciation and anaemia were progressive though appetite was well maintained, loss of hair about the eyebrows was noticed, and though towards the end it became very quiet, it was not somnolent, death was preceded by eight hours of coma.

There was distinct auto-agglutination of the red blood cells.

Goat. Inoculated from the rabbit also, developed the disease. Trypanosomes found in the blood on the 15th day and on subsequent occasions, but always in very small numbers until the death of the animal on the 28th day.

Symptoms were intermittent pyrexia, extreme wasting, anaemia, oedema of the face and, towards the end, paresis of forequarters.

The rapidity of the course which the disease took in this animal is worthy of remark, and is in accordance with the observations of one of us (W. Y.) working with the parasite obtained from a case of trypanosomiasis infected in the Luangwa valley.

Conclusions. As a result of our observations we are of opinion that the trypanosome in question is not *T. gambiense*. On the other hand this trypanosome resembles very closely *T. rhodesiense*, and is probably identical with it.

The disease was contracted in a district (Dowa sub-district of Central Angoniland) where *Glossina palpalis* has never been found, but where *Glossina morsitans* is known to exist in large numbers. It appears probable, therefore, that this trypanosome (*T. rhodesiense*) is a distinct species which is capable of transmission by some other agent than *Glossina palpalis*, probably *Glossina morsitans*.

LITERATURE

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DISEASE.
RYPANOSOMIASIS.

Notes of Case

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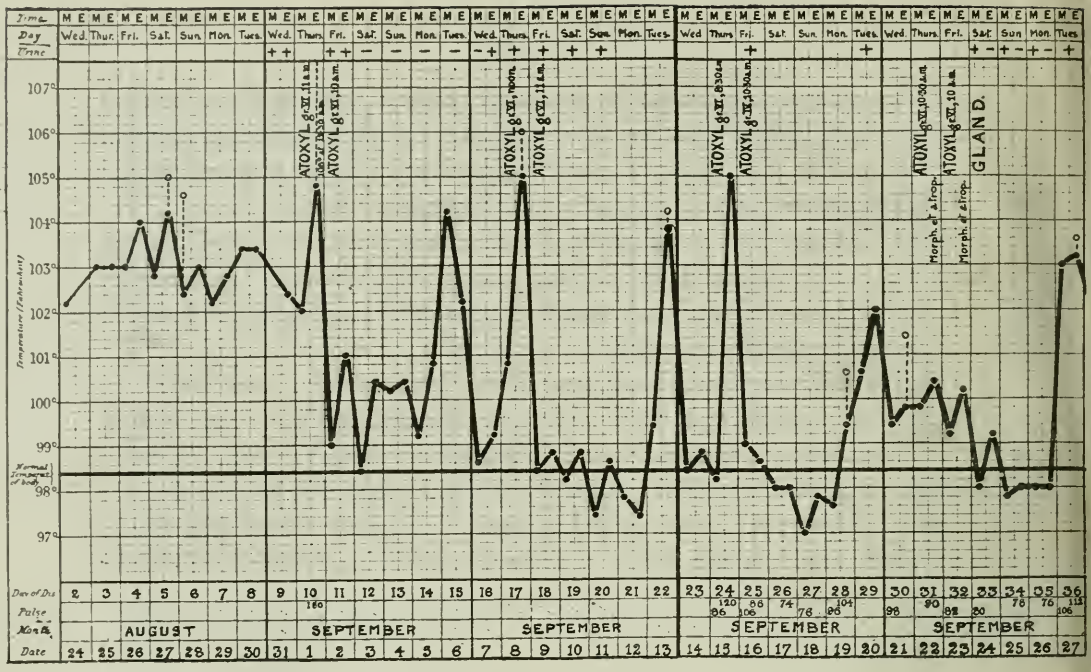

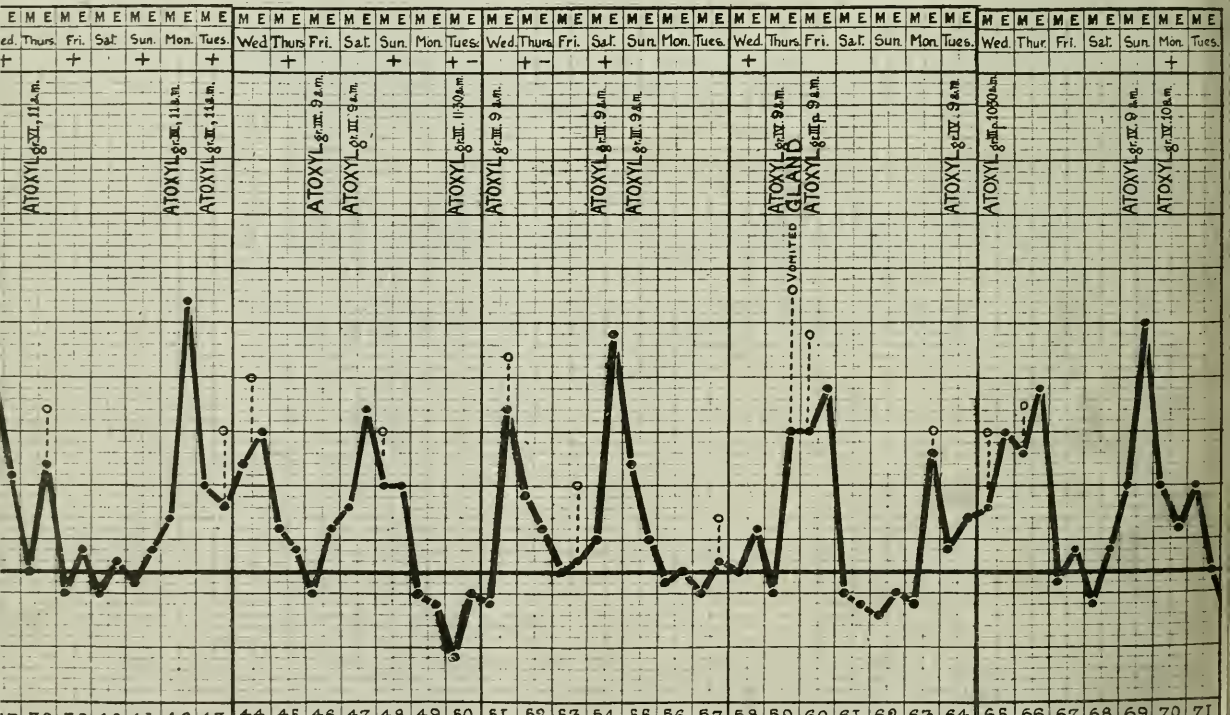

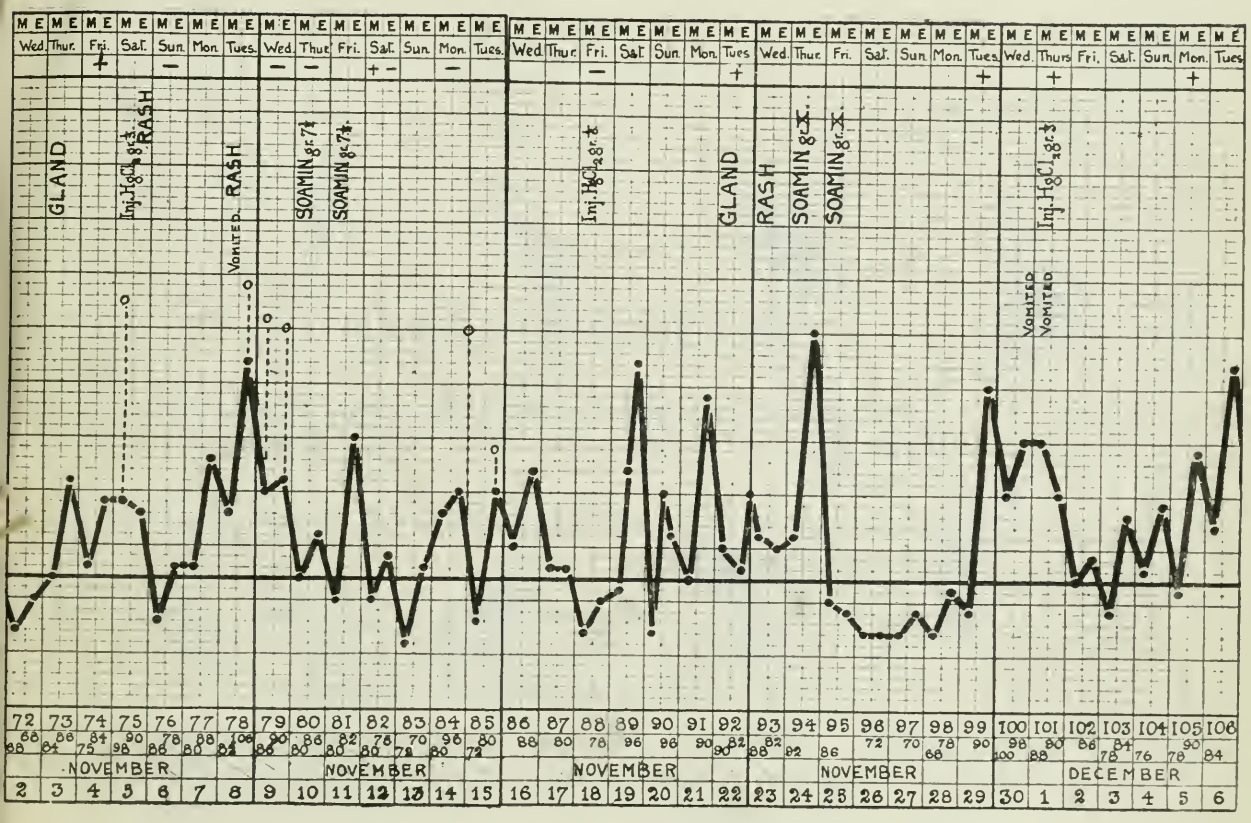
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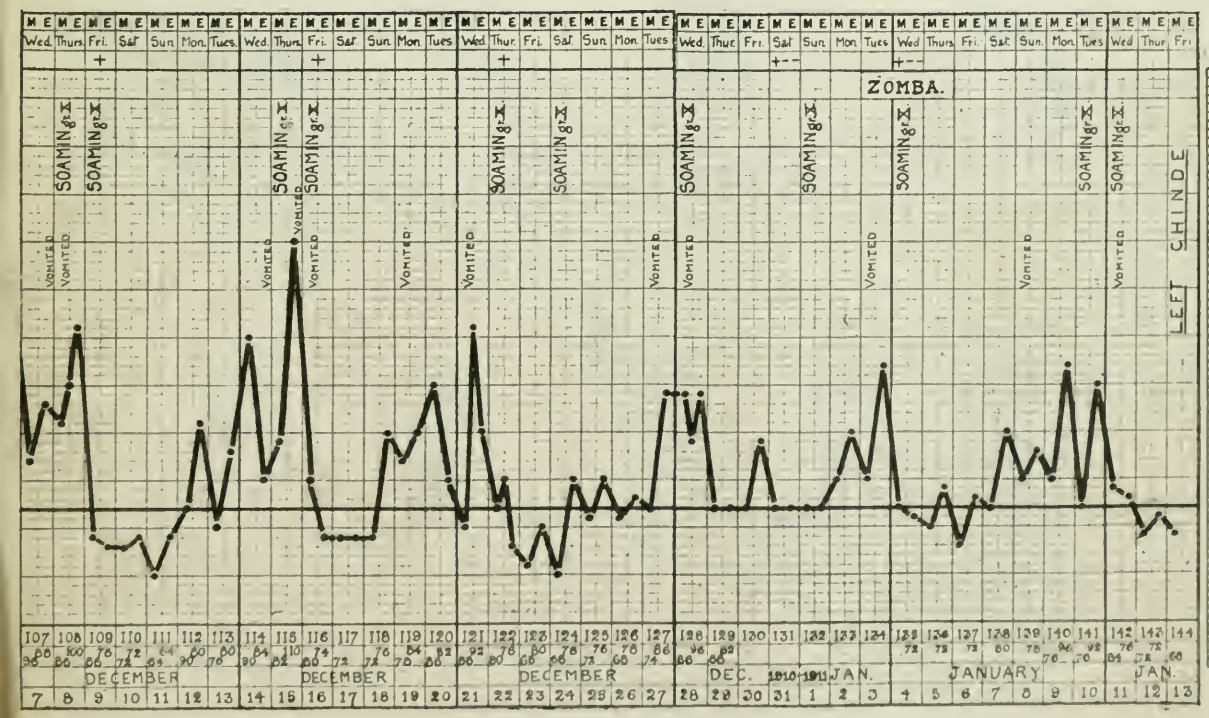
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DESCRIPTION OF PLATE XIX

Drawn with Abbé camera lucida, using 2 mm. apochromatic objective and No. 18 compensating ocular (Zeiss). Magnification 2150 diameters.

Figures drawn from parasites in the blood of the monkey, except when otherwise stated.

Figs. 1-4. Forms with the nucleus median. Figs. 1 and 2 show line connecting blepharoplast with nucleus; in figs. 3 and 4 marked vacuolation of cytoplasm is seen.

Figs. 5-12. Forms in which the nucleus is seen to become gradually more posterior until it lies on a level with the centrosome (fig. 5 from patient's blood, fig. 8 from rabbit's blood).

Fig. 13. Division form with nucleus median (from patient's blood).

Figs. 14-17. Division forms with one or both nuclei posterior (figs. 16 and 17 from patient's blood).

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